

Use of Palatal Miniscrew Anchorage and Lingual Multi-Bracket Appliances to Enhance Efficiency of Molar Scissors-Bite Correction

Nagato Tamamura^a; Shingo Kuroda^b; Yasuyo Sugawara^b; Teruko Takano-Yamamoto^c; Takashi Yamashiro^d

ABSTRACT

This article reports the successful treatment method of scissors-bite correction using miniscrew anchorage and a lingual multi-bracket appliance. A female patient, 17 years and 4 months old, had a chief complaint of crowding of anterior teeth. The patient was given the diagnosis of Angle Class I malocclusion with bimaxillary protrusion and incisor crowding. She also showed a scissors-bite of the second molar on the right side. Miniscrews were inserted into the palatal region of the upper second molar to reinforce the anchorage, and a lingual multi-bracket appliance was placed into the maxilla. Miniscrews inserted palatally were used to correct the scissors-bite in the first 3 months; afterward, they were used to retract the six anterior teeth. The total active treatment period was 26 months. Because of the bite-plane effect, the upper and lower molars were separated in occlusion, and the scissors-bite was corrected effectively within a short time. The combined use of palatal miniscrew anchorage and lingual multi-bracket appliances enhances efficiency of molar scissors-bite correction. (*Angle Orthod.* 2009;79:577–584.)

KEY WORDS: Scissors-bite; Miniscrew; Lingual multi-bracket appliances; Bite-plane

INTRODUCTION

Scissors-bite is characterized by labial eruption of the upper molar and/or lingual tipping of the lower molar and is caused by an arch-length discrepancy in the posterior region. Scissors-bite is observed most frequently in the upper and lower second molars. Several treatment procedures have been proposed to treat scissors-bite in the molars: intermaxillary cross-elastic,¹ multi-bracket appli-

ance, transpalatal arch appliance (TPA) with intramaxillary elastic,^{2,3} and lingual arch appliance with intramaxillary elastic.⁴ However, these generate extrusive forces on the second molars in both jaws and might induce an undesirable decrease in overbite, clockwise rotation of the mandible, and premature contact. In addition, treatment results might depend on patient cooperation if intermaxillary elastic is used.

Recently, dental implants,^{5,6} miniplates,^{7,8} and screws^{9–12} have been used as skeletal anchorage. Skeletal anchorage provides stationary anchorage for various tooth movements without the need for active patient compliance and with no undesirable side effects. Titanium miniscrews especially have gradually gained acceptance for stationary anchorage because they provide clinical advantages such as minimal anatomic limitations on placement, lower medical costs, and simpler placement with less invasive surgery.^{13,14}

In this report, we demonstrate a simple and fast method that can be used to correct a molar scissors-bite with the combined use of a palatal miniscrew and a lingual multi-bracket appliance with a bite-plane.

TREATMENT SUMMARY

A female patient, 17 years and 4 months of age, consulted the outpatient clinic of our university hospital with a chief complaint of crooked teeth. She had a straight profile and a symmetric frontal view, but both

^a Research Fellow, Department of Orthodontics and Dentofacial Orthopedics, Okayama University Graduate School of Medicine, Dentistry and Pharmaceutical Sciences, Okayama, Japan.

^b Associate Professor, Department of Orthodontics and Dentofacial Orthopedics, The University of Tokushima Graduate School of Oral Sciences, Tokushima, Japan.

^c Professor and Department Chair, Division of Orthodontics and Dentofacial Orthopedics, Tohoku University Graduate School of Dentistry, Sendai, Japan.

^d Professor and Department Chair, Department of Orthodontics and Dentofacial Orthopedics, Okayama University Graduate School of Medicine, Dentistry and Pharmaceutical Sciences, Okayama, Japan.

Corresponding author: Dr Shingo Kuroda, Department of Orthodontics and Dentofacial Orthopedics, The University of Tokushima Graduate School of Oral Sciences, 3-18-15 Kuramotocho, Tokushima 770-8504, Japan (e-mail: kuroda@dent.tokushima-u.ac.jp)

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Figure 1. Pretreatment facial and intraoral photographs (age, 17 years 4 months).

upper and lower lips were protruded (Figure 1). Cephalometric analysis showed a skeletal Class I jaw base relationship (ANB angle, 1.3 degrees) (Figure 2) with an average mandibular plane angle (MP-FH, 31.5 degrees) (Figure 3). On clinical examination, both canine and molar relationships were Class I on both sides, but a scissors-bite of the second molar on the right side was observed. Overbite was 0.5 mm and overjet was 3.9 mm. The dental midline was coincident with the facial midline. On cast analysis, the arch-length discrepancy was 4.2 mm in the maxilla and 7.6 mm in the mandible.

DIAGNOSIS AND TREATMENT OBJECTIVES

The patient was given the diagnosis of Angle Class I malocclusion, with a skeletal Class I jaw base relationship, lip protrusion, moderate anterior teeth crowding, and a scissors-bite of the second molar on the right side. Treatment objectives were to correct lip protrusion and incisor crowding, obtain a good facial profile,

achieve acceptable occlusion with a good functional Class I occlusion, and eliminate the scissors-bite.

The patient expressed the desire for an invisible appliance because of esthetic and social concerns. Thus, the treatment plan involved a lingual multi-bracket appliance. We planned extraction of all first premolars and the use of miniscrews for skeletal anchorage. Simultaneously, facial eruption of the upper right molar was corrected with a miniscrew-induced intrusion for lingual movement.

TREATMENT ALTERNATIVES

Several procedures have been suggested for correction of a scissors-bite. A TPA with intramaxillary elastics or intermaxillary cross-elastics is effective for the treatment of scissors-bite. However, a TPA often causes discomfort, gingival irritation, and poor oral hygiene for the patient. In addition, intermaxillary cross-elastic treatment requires patient cooperation in that the patient has to wear or replace the elastic. In addition, such treatment

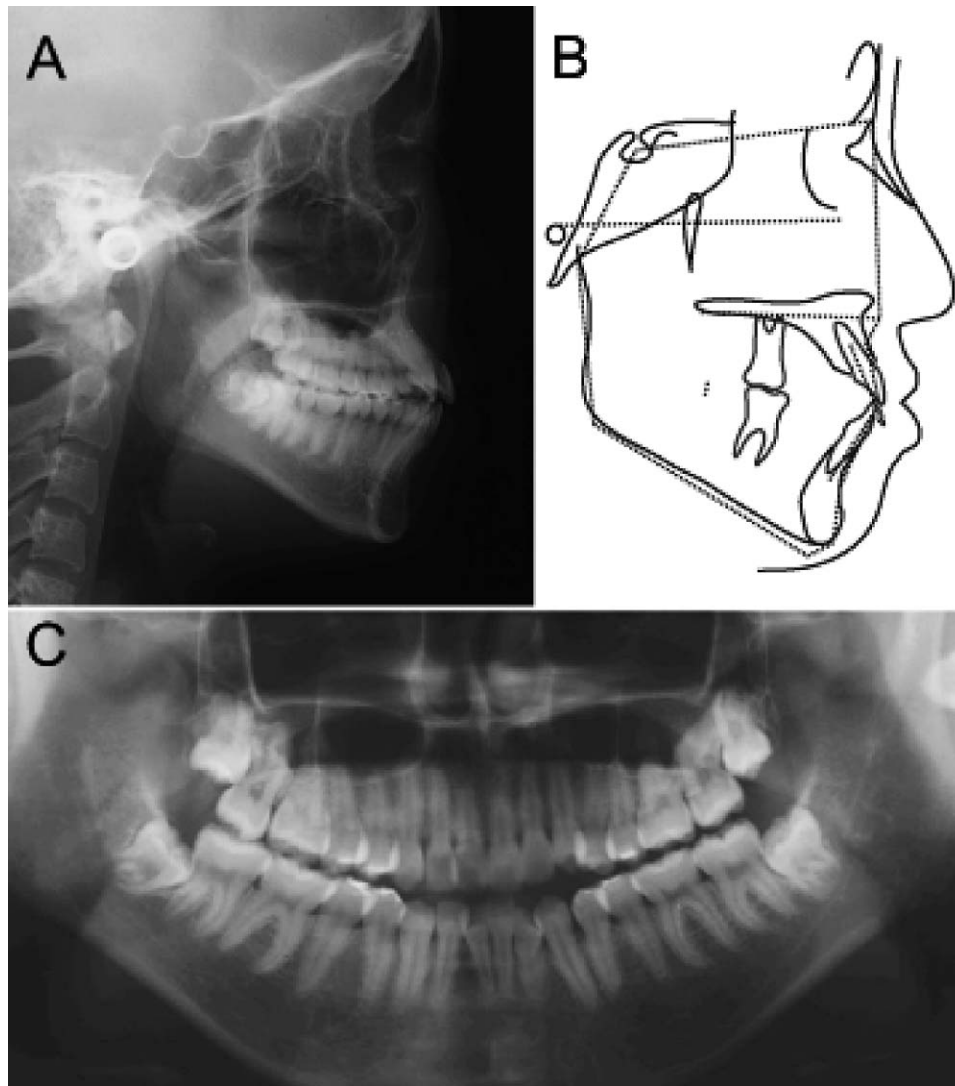


Figure 2. Pretreatment records. (A) Lateral cephalogram. (B) Lateral cephalometric tracing (solid line) superimposed with mean profilogram (dotted line). (C) Panoramic radiograph.

often gives rise to molar extrusion, which results in a reduction in overbite and/or occlusal interference. Thus, we used miniscrews to correct the scissors-bite in the right second molar with molar intrusion.

En masse retraction of six anterior teeth is common with the use of the lingual multi-bracket appliance because of esthetic concerns, but this usually requires stationary anchorage. Thus, we used miniscrews for skeletal anchorage to retract six anterior teeth.

TREATMENT PROGRESS

After the upper and lower first premolars were extracted, miniscrews (10 mm long, 1.3 mm in diameter; Absoanchor, Dentos, Daegu, Korea) were placed into the palatal region of the upper second molar to correct the buccal cross-bite (Figure 3A). These were implanted through a self-tapping method with the patient un-

der local anesthesia. A lingual multi-bracket appliance (Kurz appliance, 7th generation; Ormco Co, Glendora, Calif) was placed into the maxillary dentition. Labial molar tubes also were placed on the upper second molars on the right side. One month after miniscrew implantation, an intrusion force of 200 g was applied directly by an elastic chain. The elastic chain ran through the occlusal surface of the molar, and intrusion and palatal tipping was started (Figure 3A). Three months after intrusion, the scissors-bite was corrected (Figure 3B). A labial multi-bracket appliance was placed into the mandible. In the maxilla, after leveling and alignment with nickel-titanium (Ni-Ti) arch wires (Figure 4A), 0.016 × 0.022-inch stainless steel arch wires were placed, and retraction of the six anterior teeth was begun with a Ni-Ti coil spring with 100 g (Sentallloy closing coil spring; Tomy Co, Tokyo, Japan)

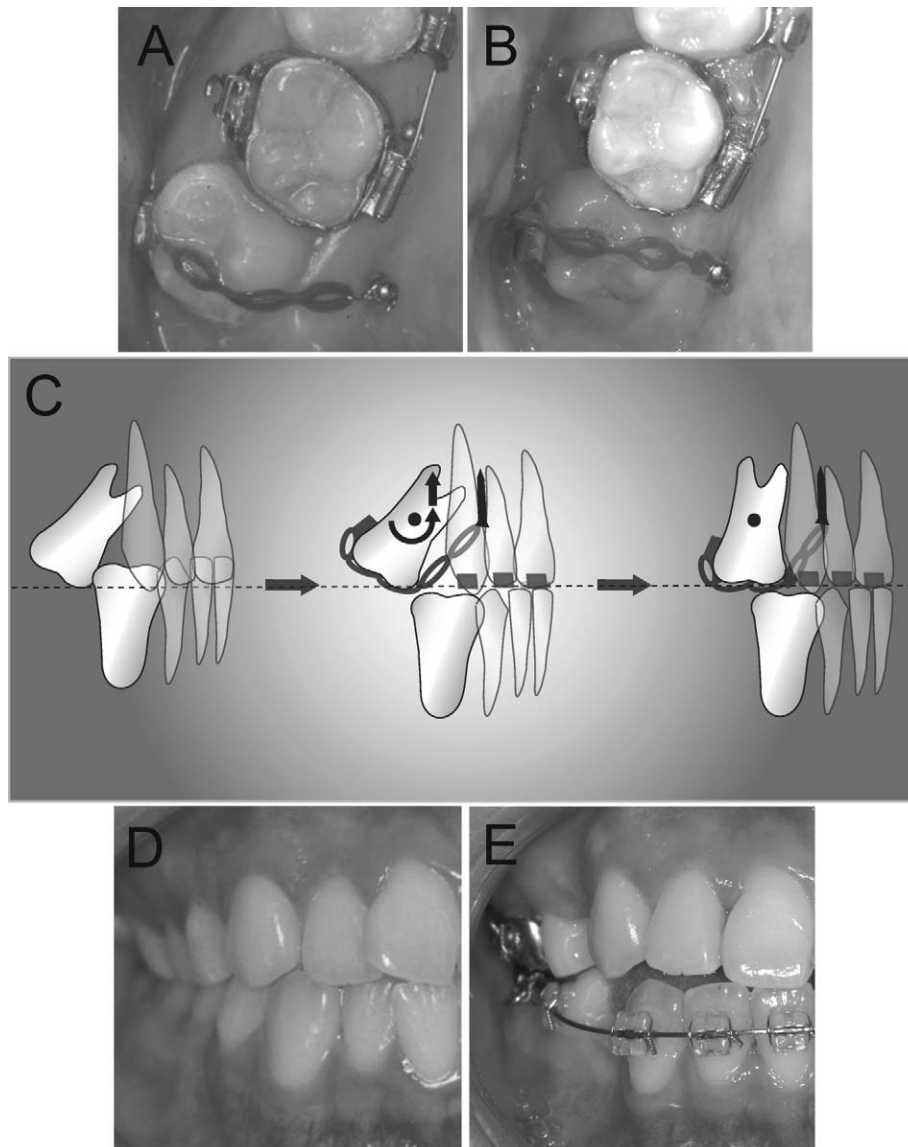


Figure 3. Photographs during the treatment progress. (A) Photographs of start of the intrusion. (B) Three months after start of the intrusion. (C) The principle of scissors-bite correction with bite-plane effect. (D) Photographs of pretreatment. (E) Photographs of bite raising by bite-plane effect.

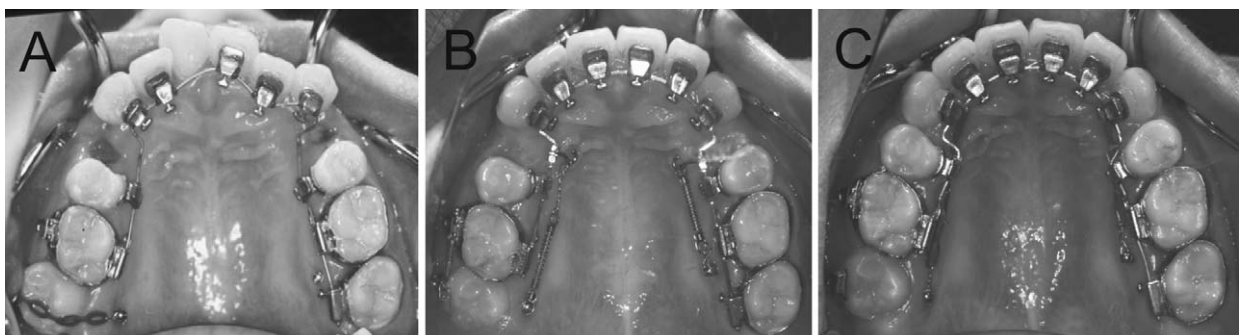


Figure 4. (A) Start of the leveling. (B) Start of the retraction. (C) Eight months after start of the retraction.



Figure 5. Posttreatment photographs (age, 19 years 9 months).

and miniscrews for skeletal anchorage (Figure 4B). Eight months after retraction, the extraction space in the maxilla was closed (Figure 4C). After the edgewise appliances were removed, an upper wraparound-type retainer and a lower lingual bonded retainer were placed. The total active treatment period was 26 months.

The miniscrews were stable for the duration of the treatment, and these screws were easily removed with a screwdriver at the end of active treatment with the patient under surface anesthesia.

TREATMENT RESULTS

Retraction of the upper and lower lips significantly improved the facial profile. Class I canine and molar relationships were maintained, and ideal intercuspation of the teeth was achieved with the improvement of scissors-bite (Figure 5). Adequate overjet (2.4 mm) and overbite (1.5 mm) also were provided. Good root paralleling was shown on a panoramic radiograph (Figure 6). Cephalometric superimposition showed the

lingual inclination of the upper incisors (U1-NF, 112.3 degrees) and an increased interincisal angle (129.0 degrees) (Table 1). The upper and lower molars moved mesially, and the mandibular plane angle was not increased.

DISCUSSION

In the present case, stable anchorage was required to improve adequately the scissors-bite and bimaxillary protrusion with anterior crowding. Several methods of acquiring bone anchorage have been reported. The patient in this report wanted lingual multi-bracket appliances, and we used miniscrews for skeletal orthodontic anchorage. Recently, miniscrews have been used as a method of skeletal anchorage because they can be inserted easily into various positions with less invasive, simpler placement surgery^{11,12,14} and sufficient stability.^{15–17} This is especially true if the palate is suitable for miniscrew placement because of rich bone mass and sufficient thickness of cortical bone.¹⁸ Park et al¹⁵ also reported that the palate between the

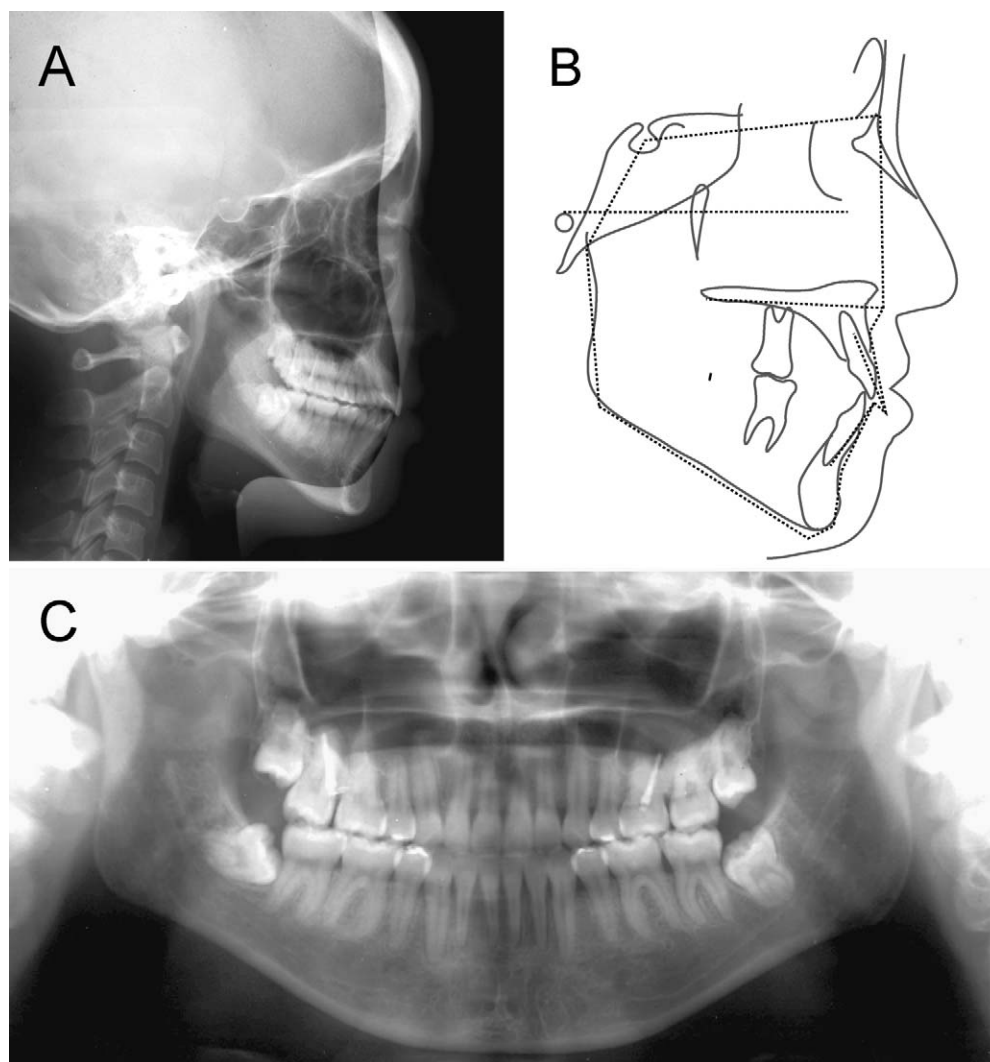


Figure 6. Posttreatment records. (A) Lateral cephalogram. (B) Posttreatment cephalogram. (C) Panoramic radiograph.

first and second molars consisted of thick keratinized mucosa and was suitable for miniscrew implantation. In addition, Park and Yun^{19,20} and colleagues reported the use of miniscrew anchorage for the correction of scissors-bite by intrusion of the upper and lower second molars. Therefore, we planned to insert miniscrews into the palate for skeletal anchorage and to improve the molar scissors-bite.

The scissors-bite in the present case might have been caused by buccal inclination and overeruption of the upper right second molar. Thus, we planned to intrude and lingually incline the upper right second molar. After premolars were extracted, braces with lingual bite planes were bonded onto the palatal surfaces of the upper teeth, and leveling and alignment of the upper arch with a Ni-Ti wire was begun. The bite planes contacted the incisal edge of the lower incisors in occlusion, and the upper and lower molars were separated immediately. At the same time, the correction of

molar scissors-bite was started by an elastic chain connected to the miniscrew and buccal tube through the occlusal surface of the upper right second molar. The bite-plane effect might be useful for correcting the molar scissors-bite because it helps the palatal inclined movement of the upper second molar by reducing occlusal contact between the upper and lower second molars. In addition, the effect contributes to avoidance of breakage of the elastic running through the occlusal surface through contact with the buccal cross-bite. As a result, complete treatment of a scissors-bite in the present case was achieved in 3 months. The bite-plane effect initially is observed after brace placement, and it usually disappears after several months. Therefore, it is recommended that the molar cross-bite be corrected immediately after the lingual devices have been placed.

Palatally inserted miniscrews are useful not only for correcting the scissors-bite but for retracting the an-

Table 1. Cephalometric Summary

| Variables | Mean | SD | Pretreatment (17 y 4 mo) | Posttreatment (19 y 9 mo) |
|---------------|-------|-------|-----------------------------|------------------------------|
| Angle, degree | | | | |
| ANB | 2.8 | 2.44 | 1.3 | 1.3 |
| SNA | 80.8 | 3.61 | 78.5 | 77.5 |
| SNB | 77.9 | 4.54 | 77.2 | 76.2 |
| MP-FH | 30.5 | 3.6 | 31.5 | 32.3 |
| Gonial A | 122.1 | 5.29 | 116.8 | 116.8 |
| U1-FH | 112.3 | 8.26 | 117.0 | 110.2 |
| U1-NF | 115.0 | 6.99 | 119.0 | 112.3 |
| L1-Mp | 93.4 | 6.77 | 94.2 | 89.5 |
| IIA | 123.6 | 10.64 | 118.9 | 129.0 |
| Occlusal P | 16.9 | 4.4 | 16.4 | 19.4 |
| Linear, mm | | | | |
| S-N | 67.9 | 3.65 | 68.5 | 68.5 |
| N-Me | 126.8 | 5.04 | 122.0 | 124.2 |
| Me/NF | 68.6 | 3.71 | 67.5 | 69.5 |
| Go-Me | 71.4 | 4.14 | 75.3 | 75.4 |
| Ar-Me | 106.6 | 5.74 | 103.6 | 103.8 |
| Ar-Go | 47.3 | 3.33 | 41.3 | 41.6 |
| OJ | 3.1 | 1.07 | 3.9 | 2.4 |
| OB | 3.3 | 1.89 | 0.5 | 1.5 |
| U1/NF | 31.0 | 2.34 | 29.1 | 31.1 |
| U6/NF | 24.6 | 2.0 | 22.6 | 24.1 |
| L1/MP | 44.2 | 2.68 | 41.6 | 40.8 |
| L6/MP | 32.9 | 2.5 | 31.3 | 32.8 |

terior segment. After the crossbite was corrected, we continued to use the same screws as anchorage for anterior tooth retraction. We previously reported that miniscrew anchorage could help provide significant improvements to the facial profile in maxillary protrusion cases compared with traditional orthodontic anchorage.²¹ In the present case, significant improvements to the facial appearance were achieved that corresponded to sufficient incisor retraction. Moreover, no patient cooperation was required to reinforce the anchorage.

In the present case, we diagnosed a slight mesial movement of the upper molar as acceptable in achieving esthetic improvement of the facial profile. The upper and lower incisors were planned to be moved distally 3 mm. As a result, the upper first molar moved to the mesial 1 mm even though miniscrew anchorage was used.

Placement of miniscrews in the posterior palatal slope has the potential to cause damage to the greater palatine artery and the palatine nerve exiting the greater palatine foramen. The greater palatine foramen is located medially to the third molar between the second and third molars.^{22–24} The greater palatine nerve exits

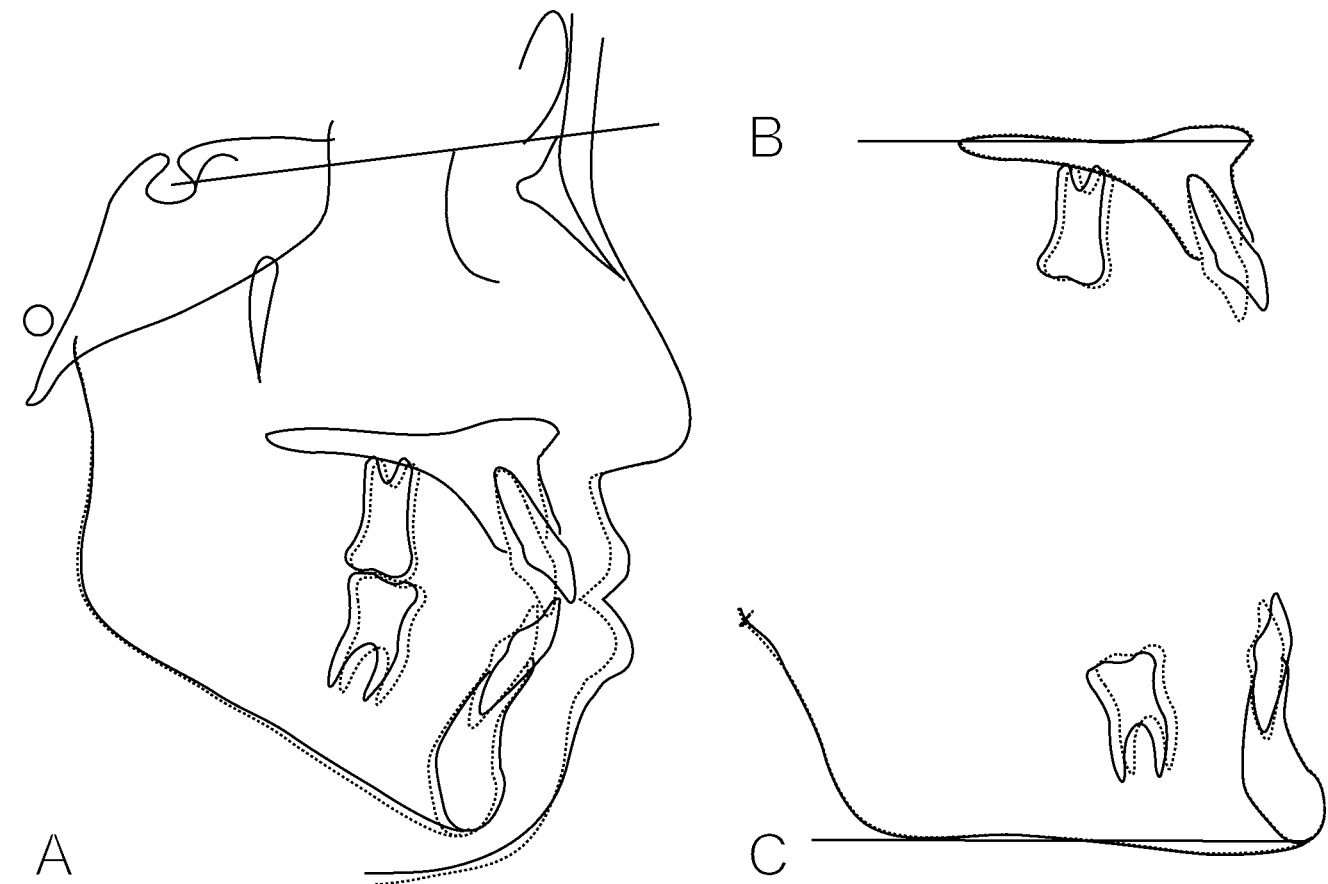


Figure 7. Superimposition of cephalometric tracings at pretreatment (solid line) and posttreatment (dotted line). (A) Superimposed on sella-nasion plane at sella. (B) Superimposed on anterior palatal counter. (C) Superimposed on mandibular plane at menton.

the foramen and runs anteriorly, 5 to 15 mm from the gingival border to the incisive foramen. Kravitz and Kusnoto²⁵ recommended that miniscrews inserted in the palatal slope should be placed mesially to the second molar. In addition, a posterior atrophic maxilla is a major risk factor for sinus perforation.²⁶ Thus, the miniscrews should be placed mesially to the second molar in the palate. However, on the right side, we had to implant a miniscrew in the midpalatal region of the second molar, which was slightly distal compared with the other side, to correct scissors-bite. The position of screw insertion in the posterior palate should be carefully proposed according to treatment objectives.

CONCLUSION

- The combination usage of palatal miniscrew anchorage and lingual multi-bracket appliances enhances the efficiency of molar scissors-bite correction.

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